

With the Author's
Compliments.

21

Gastro-Enterostomy.
J. J. Reid

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GASTRO-ENTEROSTOMY : A MODIFICATION OF
SENN'S METHOD. By F. T. PAUL, F.R.C.S., *Surgeon*
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MR PRESIDENT AND GENTLEMEN,—In September 1887, Professor Senn, at the Washington Meeting of the International Medical Congress, read a paper entitled, “An Experimental Contribution to Intestinal Surgery, with Special Reference to the Treatment of Intestinal Obstruction.” In 1889 he published this, with other papers, in his now well-known work on Intestinal Surgery—a part of the preface to which reads:—“One of the principal objects in publishing these papers in book form is a desire to stimulate the young men in our profession to enter the field of original investigation, as the author is firmly convinced that experimental research constitutes the shortest and safest route to the perfection of the principles and practice of intestinal surgery.” The wish expressed in this paragraph has certainly been fulfilled, for not only has the publication of Senn’s work marked an era in this branch of surgery, but it has been the direct stimulant for several fresh investigations. Unfortunately, in this country the obstructions placed in the way of those desiring to advance along the path of original investigation, involving experiments upon animals, are many and grievous, and are not without support from members of our own body. Indeed, I have been told in this Institution that I ought not to have performed these experiments upon dogs, but that if such an operation were desirable it should at once have been done upon a human being. It is not likely that men of minds so constituted would hesitate to put their views into practice; and thus it is more than probable that law and sentiment combined have in some instances changed the ground rather than abolished the experiments—certainly the least desirable outcome of anti-vivisection legislation.

¹ Read at the Liverpool Medical Institution, April 28, 1892.

In submitting to you the results of five operations on dogs for the establishment of a permanent fistulous communication between the stomach and intestine, I hope that, whether you consider the method an advance or not, you will at least find nothing to disapprove in the theory or practice of the experiments.

Previous to Senn's paper the operation of gastro-enterostomy was a prolonged process of careful suturing, and was extremely fatal. The bone-plate method has changed all this; it is now neither long nor very fatal. Most of the recorded operations must have been first experiences, and still the immediate results are very encouraging. It has been clearly demonstrated that an inosculation between bowel and stomach may be established, even in debilitated subjects, without any very great risk to life. This is the important point. It is quite true that in a rather large proportion of the cases the symptoms have recurred, and that this recurrence has been due to a subsequent closure of the new opening. But having once learned the secret of a safe operation, it is surely only a matter of detail to make the results obtained more permanent, and it is such a modification that I desire to submit to you this evening.

In the first place, has the failure been due to an imperfect feature in the operation, or to its imperfect performance? It occurred in the original experiments, as well as in the subsequent repetitions on the human subject, and Senn's explanation has been generally accepted and frequently repeated—namely, that the orifice in the bone-plates has been too small, or the lateral sutures have not been passed sufficiently near the margins of the wound.

Now, Senn only records four experiments. Of these, one dog died, from causes indirectly connected with the operation, on the day following. Another was killed on the seventh day. Hence the first two have little or no bearing on the question of the permanence of the opening. The third was killed on the thirty-fourth day, and the new opening was large enough to admit the index finger; the fourth on the fourteenth day, and the opening was entirely closed. Thus these few experiments by the original

operator leave the question undecided. Mr Bowerman Jessett records two experiments in which he repeated Senn's operation, killing one dog in three weeks, and the other in a month after, with the result that water passed freely through the opening in each case, but the size of the opening is not stated.

Gastro-enterostomy by Senn's method has been performed six times in this neighbourhood on the human subject, and I have seen the specimen in five cases. Three did not live sufficiently long to help in deciding this matter. Of the other three, Mr Stansfield operated on a male, aged fifty-three, suffering from malignant obstruction of the pylorus. The symptoms were relieved for about two months, then recurred in all their original severity, and on death taking place two months subsequently the opening was found entirely closed. Mr Larkin had a similar experience, symptoms of closure occurring about the same length of time after the operation, and the condition verified by post-mortem examination. I also have reported a case in which the symptoms recurred after some weeks; and though the aperture had not altogether healed, it had contracted to something like a third the original size, and the patient only lived a little more than two months after the operation. Dr George Beatson records a case in which death took place four weeks after operation, at which time the opening only just admitted the index finger, and which had therefore probably contracted to half its original size. Mr Mayo Robson mentions a case the exact counterpart of Messrs Stansfield and Larkin's, and in which, though no post-mortem was obtained, there can be no doubt closure took place somewhere about the eighth week. Mr Kilner Clark records a sudden closure on the twelfth day, but that was probably of an accidental character.

Enough has been said, I think, to prove that Senn's explanation of the closure of the artificial opening in gastro-enterostomy is not the correct one. Were the bone-plates or the suturing in fault the orifice would close sooner. Experience seems to show that the inosculation is at first quite satisfactory, and the opening remains for some weeks sufficiently free; then it slowly undergoes contraction, and the symptoms of obstruction are re-

established. I cannot help thinking that the cause of this late contraction is at least sometimes to be found in a relaxation of the strictured pylorus. When the new opening gives a sudden relief to the stomach, a constant source of irritation to the cancer subsides, and it not unfrequently shrinks in consequence, thus lessening the amount of obstruction. The same condition has often been observed in cases of malignant stricture of the rectum and colon. After lumbar colotomy for complete obstruction, it has been no unusual experience to find *fæces* shortly passing by the rectum again quite freely.

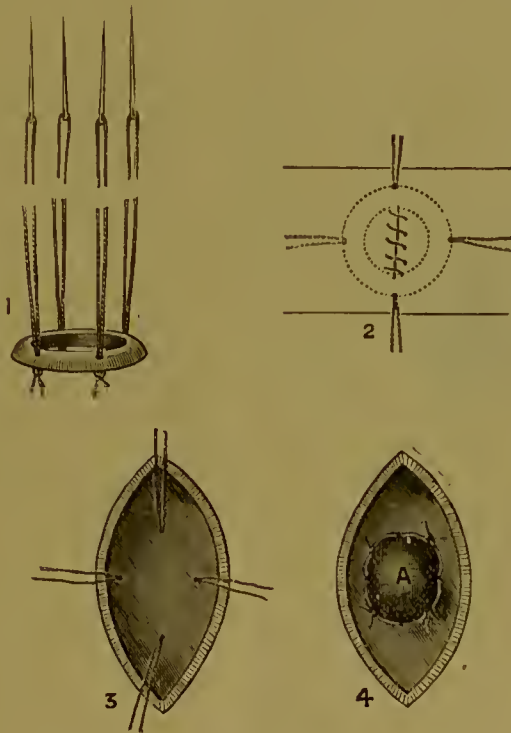
If the fault does not lie in the operator, it must be in some detail of the operation, and that detail I believe to be the character of the opening made. It is a short, clean incision, involving no loss of tissue. So long as there is no other outlet it remains patent; but no sooner does the pylorus relax than the artificial opening begins to contract.

Another decided drawback to the common method of performing gastro-enterostomy is the necessity of bringing the jejunum across the transverse colon. In my case it certainly produced a condition of partial obstruction which was very troublesome to the patient, causing flatus to collect in the large bowel. This objection has been met in two ways. One is to tear through the transverse meso-colon and gastro-colic omentum, and bring the jejunum through this opening to the front of the stomach. The other is to turn the whole stomach up, and attach the intestine to the back instead of the front surface of it. The former plan has sometimes resulted in obstruction of the bowels from kinking, and the latter is a very difficult and sometimes impossible operation to perform.

Having pointed out wherein I believe the operation devised by Senn to be liable to fail, I beg now to direct your attention to the modification which I have found to procure a perfectly satisfactory and permanent opening, in the best and most convenient position. The plan I am about to describe strangulates the connected surfaces of the stomach and intestine, effecting by sloughing a clean circular opening between the bowel and the back of the stomach, which, as far as I am able to judge

from experiments on dogs, shows no tendency whatever to contract.

The special apparatus required involves nothing more than a hard ring, preferably of bone, about $\frac{3}{4}$ -inch in diameter for human intestine, and perforated with four small equidistant holes. The ring may be rounded on all sides or only on one, as shown in the diagram (fig. 1); this edge should always be round, in order that it may not cut the piece out too sharply, and



DESCRIPTION OF FIGURES :—

- (1.) The bone-ring, charged with strong silk sutures and needles.
- (2.) Bowel with ring and sutures *in situ*, and opening temporarily closed.
- (3.) Sutures passed on through the posterior wall of stomach and brought out of anterior opening.
- (4.) Ditto tied, and portion marked A, strangulated.

lessen the breadth of surrounding adhesions. The four holes are charged each with a needle carrying a strong double silk thread, *very securely* double knotted on the under side. For dogs I used rings of $\frac{1}{2}$ -inch diameter, and generally tied the

ligatures over a second ring, though I subsequently found that this was not necessary.

The operation is performed as follows:—The abdomen is opened, and the first part of the jejunum found and brought out of the wound in the usual way. A small incision is made into the bowel where it can be applied to the lower and back part of the stomach without the least tension. Through this small wound the bone-ring is slipped into the bowel, the needles passed as in the figure (2), and the opening temporarily closed.

Next a cut of about $1\frac{1}{4}$ inches in length is made in the front wall of the stomach opposite to the spot where the inosculation is desired, and the four needles are passed in *regular order* through the transverse meso-colon and posterior wall of the stomach, and brought out of the front opening (fig. 3). When they are drawn tight, of course the intestine is firmly applied to the back of the stomach, and by cutting off the needles and tying the ligatures tightly as in the figure (4), the included discs of bowel and stomach are strangulated between the ring in the former and the ligatures in the latter. Whilst the parts are still held forward with the ligatures, the centre of this area may be cut out with a tenotomy knife, thus at once effecting a communication between the two viscera. Then the ligatures are cut short, the parts allowed to drop back into position, and the opening in the front of the stomach closed by a double row of fine green catgut sutures, a continuous row in the mucous membrane, and Lembert sutures in the outer coats.

Finally, the stomach is turned up if possible, and a few Lembert sutures applied on the outskirts of the inosculation to retain the parts in position when they lose the support of the ligatures by sloughing on the second day. These sutures are much more important in this than in Senn's operation; but if they cannot be used owing to fixation of the organ by cancerous infiltration,—and it must be a very bad case in which none can be passed,—the patient should be kept very still for at least a week. Such additional support is much less urgently needed

when the intestine is applied to the back than when it is applied to the front of the stomach, as the tension in the former case is much less; but it should never be neglected.

Experiments.—The experiments were all performed upon mongrel terriers about the size of an ordinary fox-terrier, and the bowel used was that which was lying nearest to the posterior and lower region of the middle of the stomach at the time.

(1) In this case two rings $\frac{1}{2}$ -inch in diameter were used, one in the intestine, the other in the stomach. No Lembert sutures were applied round the inosculation. The animal suffered very little from the operation, taking his food well all the time. He was kept on bread and milk for about a week, and subsequently on ordinary diet. The bone-rings, slightly digested, were passed on the fourth day, in the second motion since the operation. Killed on the 31st day. The opening was circular and free, but its size was not estimated until after the parts had been hardened in strong spirit, when it only measured $\frac{1}{3}$ -inch in diameter. The incision in the front of the stomach could scarcely be detected, and there were hardly any peritoneal adhesions except those concerned in the gastro-enterostomy.

(2) The proceedings were here reversed, the first ring being inserted into the front of the stomach, and the ligatures tied over a second ring in the duodenum, through an opening on its opposite side. There was a little tension on the parts, but no supporting Lembert sutures were put in. The dog did very well for twenty-four hours, then seemed rather uneasy, and the following morning was found dead. An examination showed that the heavy duodenum—it is very thick in the dog—had partly broken through the fresh adhesions round the slough, and permitted a fatal extravasation. Until this case I had not rounded off the outer edge of the rings, nor used surrounding sutures. After it I adopted both, but did not repeat the operation on the front of the stomach, as everything was more favourable for the opposite position.

(3) The operation was performed as in the first case, but with the two precautions suggested by the last. The dog did well

throughout, and was not killed until the 107th day. He had increased in weight. The opening was found to have been made between the back of the stomach near the pylorus and the top of the colon. It readily admitted a half-inch test tube, thus showing that in this long period it had undergone no contraction, for the outside diameter of the bone-rings used was half an inch. This case is especially valuable, because it is almost certain that the new opening must have been quite functionless, and still did not contract. Had food passed through it into the colon, nutrition would have suffered; and had fæces escaped by it into the stomach, vomiting, as shown by the next case, would have occurred.

(4) The same operation was repeated. He was stronger than any at first, and passed the rings on the fourth day. After about a week he began to suddenly throw up yellow vomit, and later on fæcal vomiting became so severe that he wasted rapidly, and I had him killed on the twenty-second day. On examination a larger opening than in the last case existed ($\frac{5}{8}$ -inch rings were used) between the back of the middle part of the stomach and the middle part of the small intestine. There was no constriction whatever, as the specimen shows, in the intestinal canal, but it was apparently easier for liquid fæces to flow back into the stomach than to continue onwards in the bowel. Food had evidently passed out of the stomach by the pylorus, short-circuited back by the new opening, and then been regurgitated. The mucous membrane of the stomach was a good deal inflamed, owing, no doubt, to the irritation of fæcal matter. The course of the case is the best proof of the extremely free nature of the opening. It is unnecessary to point out that, for obvious reasons, such untoward results could not occur when the upper part of the intestine was selected, nor when the pylorus was strictured.

(5) The same operation, using only one ring, the ligatures being tied in the stomach on the bare mucous membrane. The ring was carefully sought for in the motions, but never found, so was probably digested. He recovered as well as usual, except for a short attack of fæcal vomiting; but on the

twenty-fourth day accidentally got hold of some poison in my laboratory which is used for practical toxicology, and seemed so ill that I had him killed with chloroform. At the post-mortem I found the same clean circular opening, measuring a full half-inch in diameter, at about the same position of the bowel as in the last case.

From these cases I think I am justified in assuming—(1) That the operation of gastro-enterostomy performed in this way with due precautions is as safe as with the decalcified bone-plates. (2) That the new opening is in a better position. (3) That it will not spontaneously close. And (4) that it involves no unnatural displacement of the bowel in applying it to the stomach.

I have no desire to claim for this proceeding that it is anything more than a modification of Senn's operation, and the idea of working through an accessory opening I obtained from Dr Maunsell's paper on resection of the intestine, published in the Transactions of the Intercolonial Medical Congress of Australia for 1889.

Should experience in the human subject show this to be a more dangerous proceeding than Senn's, it might still be utilised as a method of attaching the intestine to the *back* of the stomach by means of his decalcified bone-plates—a difficult and often impossible process to accomplish with safety by his method of operating.

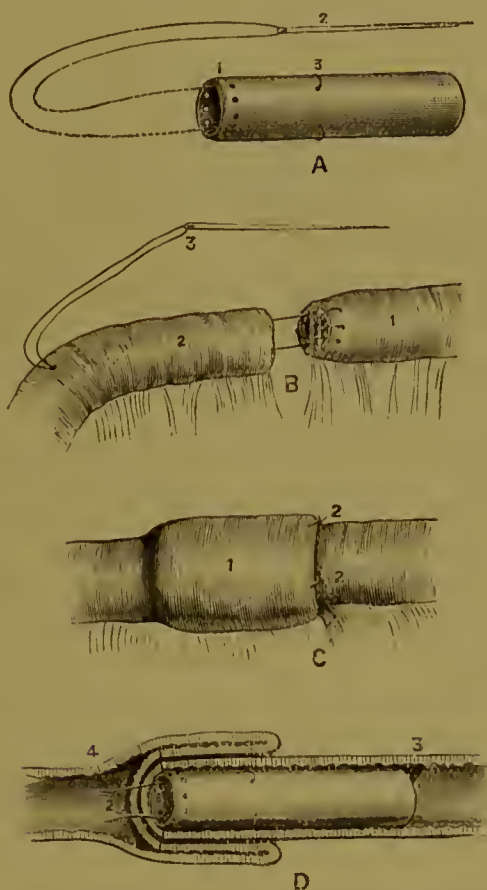
It was suggested at the Institution that the results of the experiments would have been more reliable had the pylorus been occluded at the same time. Without admitting this, as I think a functionless opening much more likely to close than one in constant use, on May 17 I excised a crescentic portion of duodenum near the pylorus, leaving a track which would just about admit a probe, and then connected the next part of the duodenum with the back of the pyloric end of the stomach. This operation was a very severe one, and the dog was seriously ill for about ten days, when he began to recover, and is doing well up to the present. There is, so far, no obstruction between the stomach and intestine, though it is certain that all food must be passing by the new opening.

A CASE OF ENTERECTOMY.

ON April 9, 1891, I brought forward at this Institution the results of an experimental operation on dogs for the end-to-end union of divided intestine. The method is as follows:—First, the operator is prepared with a decalcified bone tube, like that shown in the diagram A, to which is attached a needle and a strong silk thread, called the traction thread. The tube is required chiefly to enable the operator to produce an invagination of the bowel which will cover the line of union; but it is also useful for keeping open the channel of the intestine, and as a splint to keep the parts quiet during the early stages of repair.

The piece of bowel having been excised, the tube is sewn into the upper end, and the traction thread passed through the wall of the lower segment about three inches down, as in figure B. Next, the two cut ends of bowel are quickly attached to each other with a continuous suture. An assistant now draws firmly on the traction thread, whilst the operator produces a short invagination which is retained in position by three or

four Lembert sutures (fig. C). Finally, the traction thread is drawn tight and cut off short, its ends dropping into the bowel.



A, the decalcified bone tube. 1, the lower or distal end perforated for sewing to the bowel; 2, the traction thread armed with long sewing needle; 3, its attachment to the tube.

B, a stage in the operation. 1, the proximal end of the bowel with the tube sewn in; 2, the distal end not yet sewn to the proximal end, but with the traction thread 3 passed.

C, the operation completed. 1, the sheath or intussusception of the invagination; 2, the Lembert sutures for retaining the parts in position.

D, the parts dissected. 1, the tube *in situ*; 2, the traction thread cut short; 3, the proximal end of bowel entering the intussusception; 4, the distal end supplying the returning and ensheathing layers.

It is claimed for this operation that—(1) the closure is absolutely secure so long as the bone tube remains intact, or until sloughing has had time to occur; (2) a free passage is at once established; (3) the opening does subsequently diminish

or close; (4) the operation has had the appearance up to the present of being, *per se*, free from danger.

Shortly after concluding the experiments, I met with a case of cancer of the descending colon, in which I hoped to be able to try the operation, but found that, owing to want of sufficient mesentery, a satisfactory invagination could not be produced in this situation, and had to adopt another method.

Recently, in a case of excision of the cæcum, I again tried to invaginate the large bowel. It readily tucked in for $\frac{1}{2}$ or $\frac{3}{4}$ of an inch, but would go no further, and had no grip, as in the case of small intestine. If left alone, the invagination would have immediately unfolded itself, and it depended entirely upon sutures for its maintenance. I have, therefore, come to the conclusion that the method I advocate is only to be thoroughly relied upon when applied to small intestine, though the tubes may and have been used very successfully in certain cases of resection of the colon.

On November 22, I at last had the opportunity of putting this operation into practice at the Royal Infirmary. The patient was a delicate-looking woman, confined only six weeks previously. She was 37 years of age, and the mother of seven children. About four years ago she first noticed a small lump in the right groin. It did not trouble her except when doing heavy work.

Her present illness commenced ten days before admission. She was attacked with severe shivering and pain in the back. The second day she remained in bed, feeling very ill. Could take no food, but did not vomit. The pain moved from the back, and was now of the nature of shooting pains across the abdomen. The third day she was rather better; got up and took a little food, but vomited. The fourth day was better still; went out and did a day's charring. After returning home in the evening was seized with severe shooting and twisting pains in the abdomen. Vomited what she had taken for dinner. Drank some beer, but vomited it immediately. Bowels moved slightly. Went to bed and put hot cloths on the abdomen. The fifth day the pain was much worse. Vomiting and thirst; pills

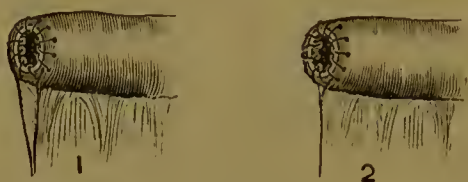
given to relieve constipation. The sixth day was very ill; vomited everything. Seventh day the same. First noticed the vomit to be brown and slimy, and to have a nasty smell. The eighth day vomit the same. Castor oil enema given with very little effect. On the ninth day the patient was very ill; the abdomen began to swell, and she thought she was going to die. She was brought to the Royal Infirmary.

On seeing her I found she was in a very weak condition, but not so bad as one would have expected from the duration of the obstruction. The abdomen was only moderately distended. The vomit copious, and foully stercoraceous. All pain was referred to the umbilicus. In the right groin there was a small hernia; it was soft, and not the seat of pain.

The history guided me in the first place to make a small opening in the middle line of the abdomen and explore with the finger, as being the most likely course in which one incision would suffice. In this way a heavy fold of bowel was detected passing across the top of the pelvis and stopping at the hernia. A second incision was therefore at once made over the sac, which exposed a soft piece of partly blackened omentum, and underneath it a small knuckle of bowel. The latter was not gangrenous, but directly it was disturbed a little faecal matter escaped. To prevent extravasation, the neck of the sac having been divided, the bowel internally was grasped with the right hand, and brought out of the abdominal wound the instant it was reduced with the left. Examination showed the constricted part to have given way on one side, and to be on the point of giving way on the other; excision was therefore imperative.

The bowel having been clamped, the affected part, which only measured $1\frac{1}{2}$ inch, was rapidly cut away with scissors, the mesentery being ligatured in one piece. A bone tube was then sewn into the upper end with a fine green catgut suture, great care being taken to attach the mesenteric border securely (see figs. 1 and 2). This important point has been emphasised by other surgeons. To neglect it is certainly to neglect one of the safeguards of this class of operation. Next, the traction thread was passed through the wall of the lower segment, the cut ends

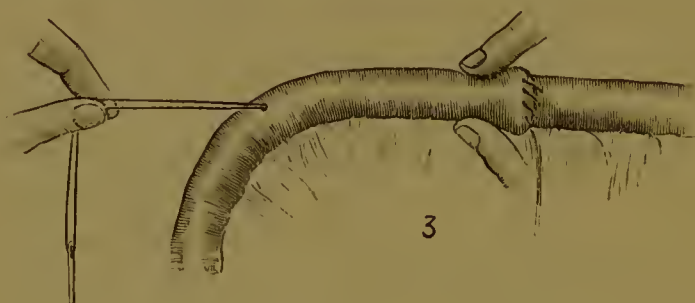
of the bowel sewn together with another fine green catgut suture, and the wound in the mesentery united. Then my



(1) Showing the cut mesentery improperly allowed to gape.

(2) The mesentery drawn together ; but the diagram wrongly indicates a stich passing through the bowel *without* piercing the mesentery.

House Surgeon, Mr P. E. Davies, held the traction thread firmly whilst I invaginated the bowel for about half an inch, fixing it



Producing the invagination *immediately* below the cut.

in this position with four small Lembert sutures. The traction thread was drawn tight, cut off short, and the ends allowed to drop into the bowel.

When invaginating an error must be guarded against. The invagination is most easily produced by allowing it to commence about half an inch or so below the tube (fig. 4). This means



The invagination carelessly produced. The lumen of the bowel is partly closed, and the line of suture barely covered.

that the cut will be barely covered by it, whilst the lumen of the bowel will be considerably blocked, and the operation consequently most imperfectly performed. It must be made to commence *immediately* below the tube by drawing the very

first part of the lower segment upwards with the tips of the fingers (fig. 3), and care must be exercised to observe that the mesenteric side of the bowel is as thoroughly covered by the invagination as the other side.

When completed the intestine looked very neat and secure, the wound being of course invisible under the invagination. It was returned into the abdomen, and the parietal incision closed with sutures of fishing gut.

Attention was next directed to the hernia. The discoloured omentum was ligatured and cut off, and the inflamed and thickened sac excised. The wound was only partly closed, on account of the condition of the omentum and the staining of the parts with faecal matter. The double operation, including the administration of ether, did not exceed 50 minutes, though, as it was Sunday evening, we were very short-handed.

When the patient recovered from the anæsthetic, the stercoraceous vomiting recurred again and again, until we feared she would collapse. About three hours after the operation I injected brandy and beef peptones into the rectum, and then morphia subcutaneously until it stopped. After this she passed a fair night, and subsequently progressed so well that very few details need be mentioned. The pulse soon fell to normal, and the temperature never exceeded 100° . The day after the operation she took a pint of arrowroot and brandy and a tin of Brand's essence. The second day a pint each of beef-tea and arrowroot, as well as the Brand's essence. On the fifth day lemon whey was added to the diet. On the sixth bread and milk. On the seventh bread and butter. On the eighth custard pudding and baked apple. On the twelfth an egg. On the fourteenth chicken, and from this time a liberal diet was maintained.

The bowels were first moved by glycerine enema on the eighth day after the operation, and subsequently at intervals of a few days, the injection being used each time. Once there was a little cause for anxiety, owing to an attack of constipation; but it proved to be nothing more than an accumulation of feces in the rectum, which was completely removed by a good dose of

castor oil. No trace of the bone tube was at any time found in the motions.

Three weeks after the operation the patient was first allowed up, and from this time she may be said to have been convalescent. On Christmas Day, just over the month since her admission, she was able to enjoy the extra fare supplied to the patients, and a few days later left the hospital quite recovered.

Six months after the operation she wrote, "My bowels are very regular, and I feel myself strong and quite well again."

I have repeated the operation once subsequently, in a case of intestinal obstruction. The patient only lived thirty-six hours, but death was due to continued paralysis of the bowels. The union of the invagination was quite firm all round.

Dr Alexander has reported to the Society that he has on three occasions resected the colon for the cure of artificial anus, using the decalcified bone tubes, and producing an incomplete invagination. Two of the cases recovered at once, and the third after a further operation. So far as I am aware, the method has not been used on any other occasion in the human subject, though Mr Jessett records, in the *British Medical Journal* for April 2, 1892, the successful use of the tubes in experimentally repeating an operation devised by Dr Robinson of Toledo.

THE INTESTINAL DRAINAGE TUBE.

IN February 1891 I submitted to this Society a case of cancer of the rectum, in which a preliminary inguinal colotomy had been done. The point of the case was that the bowel had been opened at once, contamination of the wound and the peritoneum being guarded against by the insertion of a glass drainage-tube made for the purpose. Later in the year I published further cases of inguinal colotomy performed in the same way in the *British Medical Journal*.¹ This communication was followed by letters and other papers from Messrs H. A. Reeves,² W. H. Allingham,² Harrison Cripps,² Mayo Robson,³ and Robert Jones.³ Messrs Allingham and Cripps both wrote objecting, not to the use of the glass tube, which they in no way referred to, but to the variety of colotomy which I had associated with it, namely, Mr Jessett's modification of Madelung's operation. My object was simply to indicate a safe, easy, and useful way of opening the bowel without waiting two or three days for adhesion of the peritoneal surfaces; not at all to advocate any special method of doing the colotomy. Indeed, after reading their letters, I decided to try the plan with their operation, and admit that it is more rapid, easy, and safe, though not quite so neat and perfect in its results.

At the time of publishing the cases of colotomy, I suggested that the use of the glass drainage-tube in bowel operations might have a more general application, and since then I have used it in cases of extensive cancer of the rectum, and in acute intestinal obstruction, and in excision of a malignant stricture of the colon. From the results obtained in these cases, I feel sure that it is a valuable addition to the treatment, which I hope others may be induced to try.

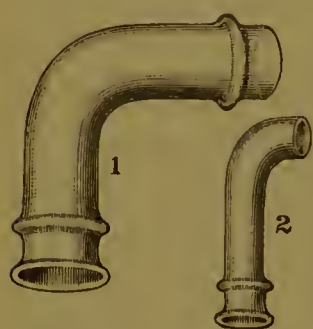
¹ July 1891.

² August 1891.

³ January 1892.

Up to the present no cases but mine have been published, but I know there has been some demand for the glass tubes outside Liverpool, and my surgical colleagues, Mr Mitchell Banks and Mr Rushton Parker, have both signified their approval by using them. Moreover, the papers published by Mr Mayo Robson and Mr Robert Jones indicate that others have felt the need of some such plan, and have been pleased with the results they have obtained by their methods of emptying the bowel. The former uses a special trochar and cannula, and the latter india-rubber tubing. An American surgeon also has used large rubber tubing in excision of the rectum.¹

The glass tubes are made in two sizes. That used for the colon or rectum (fig. 1) has been improved in shape by Messrs Wright & Co., of New Bond Street, who have succeeded in bending it at the proper angle, which avoids all strain on the



bowel. It measures 5 inches in length by 1 in diameter, has a double rim at the bowel end and a single rim at the distal end, and is bent at a right angle. The tube for the small intestine (fig. 2) is as light as is consistent with sufficient strength. It measures $2\frac{1}{2}$ inches by $\frac{1}{2}$ an inch, and is bent at a right angle at the distal end. Faeces from the large tube are received into a jaconet bag containing wood wool or other absorbent material, except the first rush in cases of obstruction, which is best received in a basin. To the small one an india-rubber tube is attached, which conveys the liquid faeces of the small intestine into a bottle beneath an antiseptic fluid.

The plan recently adopted for colotomy has been to make the incision and withdraw the bowel, as recommended by Messrs Cripps and Allingham. Then packing round the bowel with gauze, a small incision is made at the convex margin, and the glass tube plugged with wool introduced, and tied in with stout silk ligature. It is usually quite unnecessary to sew the bowel to

¹ The tubes have since been successfully used by Dr J. D. Hayward and Mr F. Charles Larkin.

the wound, as is done by the above-named surgeons. Lastly, the jaconet bag is attached, and the wound dressed with iodoform, cyanide gauze, and salicylic wool. It has been objected that the bowel cannot be opened without risk of letting the fæces escape over the wound; this has never happened to me, and I do not think it requires especially nimble fingers to avoid such an accident. The silk ligature may cut the bowel in about three days; but it not unfrequently remains for a week firmly adherent, partly because some of the circulation becomes re-established beyond the ligature, and partly owing to the copious exudation of lymph, which covers the bowel to the very end, quite concealing the ligature. It has been the exception, not the rule, for the coats of the bowel to give way on the third day. In cases where the mesentery is short, no subsequent operation is necessary; but when it is long, a good deal of bowel comes out in Mr Allingham's operation, and it may be advisable to excise the superabundant coil in about a fortnight.

In cases of cancer of the rectum requiring extensive excision I always follow Dr Alexander's operation; but as soon as the bowel is well drawn down I open it through the stricture, and tie in the glass tube, previously plugged with wool to prevent the escape of fæces. The operation is then completed in the ordinary way. As a rule, there is a large quantity of motion passed in these cases during the first twenty-four hours after the operation; but with the help of the tube we have not experienced the slightest difficulty in keeping the wound, not only free from contamination, but aseptic.

In acute intestinal obstruction I have, as yet, not had very much experience with the tube, the few cases in which I have been able to use it having been too bad to give any kind of treatment a fair chance. Still I believe that in no class of case will the fæcal drainage-tube ultimately prove to be more serviceable than in this. My general experience is that if when relief by a sound operation is given the fæcal matter rapidly passes on, all goes well, and the patient recovers; but if the bowel is heavy, paralysed, and full of gas and motion, which does not pass on, though the obstruction is removed, the

patient invariably dies. I am therefore of opinion that in all cases in which the bowel is much paralysed and distended it would be wise to insert a small glass tube into the convex margin of the intestine somewhat above the seat of obstruction, even although the obstacle has been completely overcome; and also that in all cases in which the abdomen is greatly distended, and the patient's endurance wellnigh exhausted, as is far too often the case when they come under the surgeon's hand, it would be wise to restrict the operation simply to the insertion of the tube into the most prominent distended fold, leaving further measures to be taken when the patient's powers are somewhat restored.

A NOTE ON ETHER.

AT the discussion on chloroform at this Institution on November 5th, 1891, a strong statement was made by one of the speakers, Mr Larkin, to the effect that ether administered in an open inhaler cooled the air respired by the patient to freezing point, and reduced the patient's temperature sometimes as much as two degrees. As an advocate of the open inhaler I took decided exception to this statement, and at once instituted experiments to disprove it. However, when only two series of observations had been conducted, a printed report of the speech was published in the *Liverpool Medico-Chirurgical Journal* in which the statement appeared in so moderate a form as to lead me to discontinue the observations. The paragraph reads (page 207, No. 22)—“In the open inhalers the air must, he thought, be cooled by the evaporation of the larger quantity of ether used, and it was common—nay, usual—for the moisture of the breath to freeze on the top of the gauze ether-holder, and he had himself noticed that a thermometer placed on the gauze fell to zero. He had also noticed a fall of temperature in the axillæ of patients under anæsthesia on several occasions. In one a fall of nearly two degrees was noticed. He had observed greater falls under ether than under chloroform, but had not repeated the experiment sufficiently frequently to say it was usually so. He admitted also that the fall might possibly have been due to shock.”

It may be pointed out that the moisture of the breath also freezes on the outside layer of gauze when chloroform is used on the same inhaler; but it is the original statement, and not the printed report, that I disagree with. It was made with the weight of experience, and before a crowded meeting, and I therefore wish to record, under similar circumstances, the observations which were commenced as a reply to it.

CASE 1.¹—Healthy woman, aged 35. Excision of bursa patellæ, for chronic bursitis, December 7th, 1891. Ether was administered on the open inhaler. Patient fully anæstheticised in 5 minutes. Duration of inhalation, 25 minutes. Amount of ether used, $3\frac{1}{2}$ ounces. Temperature of the theatre, 65° F.

Time.	Temp. in Vagina.	Temp. of Air inside Inhaler.
8 minutes.	100°.	81°.
13 „	99·8°.	81°.
20 „	99·8°.	81°.
25 „	99·8°.	84°.
27 „	99·4°.	

CASE 2.—Healthy woman, aged 32. Excision of bursa patellæ for chronic bursitis, December 15, 1891. Ether was administered on the open inhaler. Patient fully anæstheticised in 4 minutes. Duration of inhalation, 20 minutes. Amount of ether used, $3\frac{1}{4}$ ounces. Temperature of the theatre, 69° F.

Time.	Temp. in Vagina.	Temp. of Air inside Inhaler.
4 minutes.	100·2°.	80°.
9 „	100°.	85°.
14 „	100°.	86°.
20 „	100·2°.	86°.

In these two cases we found that the patient's temperature rose during the first stage of anæsthesia, and their breath heated the air inside the inhaler to 80° F. or more. I am not at all advocating the entire use of ether; but when I combine it with another anæsthetic, I prefer chloroform to carbonic acid, and, under all circumstances, the open to the closed inhaler.

¹ For the following careful notes, I am indebted to my senior dresser. Mr J. P. Nixon.

